

University of Massachusetts Boston
College of Science and Mathematics

CHEM 116	CHEMICAL PRINCIPLES II Fall, 2008	SYLLABUS
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Instructor	Hannah Sevian, Ph.D., physical chemistry Associate Professor, Chemistry (CSM) and Science Education (GCE)
Office Telephone	617-287-7724
E-mail	hannah.sevian@umb.edu
Time and Location of Course	Tu/Th 2:00-3:15 Science building, 1 st floor, room 003A (Lipke Auditorium)
Office Hours	Tu/Th 3:30-4:30 and other times by appointment at my office
Office Location	Wheatley 4 th floor, room 181

Although I do have set office hours, I encourage you to seek assistance from me at other times as well. Email is the best way to reach me, and I always respond to questions sent by email. If you would like to arrange an appointment outside of office hours, please email me. If you do not have easy access to email and if you are unable to reach me directly by phone, you can also reach me through my administrative assistant at 617-287-7587.

All information concerning this course is available on the course website, which can be linked to from www.chem.umb.edu, and which you should visit frequently.

Course Description

Introduction to acid-base systems, elementary thermodynamics, chemical kinetics and equilibria, electrochemistry, oxidation-reduction reactions, and a survey of the chemical properties of elements based on principles already introduced. Laboratory work presents qualitative and quantitative analysis. This course is intended for majors in any of the sciences, including pre-dental, pre-medical, and pre-engineering students.

Course Prerequisites

Successful completion of Chem 103 or Chem 115.

Required Texts

- Brown, LeMay & Bursten, Chemistry: The Central Science, 10th ed. The book is available in the bookstore as a special bundle that includes the Student Solution Manual. Although the publisher has released a new (11th) edition of this text, for Fall 2008 we will continue to use the 10th edition since many of the students in the course already own the 10th edition from when they took Chem 115.
- Eubanks & Eubanks, ACS General Chemistry Exam Official Study Guide. Available by direct purchase from the American Chemical Society, or at the University Bookstore. If you would like to order it from ACS, the order form is located at http://www4.uwm.edu/chemexams/guides/details_guides.cfm?ID=162
The general chemistry study guide costs \$15.00, but shipping costs \$6.00, regardless of how many study guides are ordered. You may wish to find some other students in this course and consolidate an order to avoid paying so much in shipping. You will want to have a study guide before Exam 1.

Other Required Materials

A scientific calculator (capable of calculating logarithms, square roots, non-integer exponents). Bring this with you to every lecture, lab, and discussion section.

Course Structure

There are two components to the 116 course: lecture and discussion. You are required to co-register for the lab (Chem 118), unless you have already taken and passed Chem 118 course or its equivalent.

Lecture

Lectures, not the book, constitute the principal source of material for the tests. The lecture slides that I will use in class are available for printout on the course website, under "Lectures," and you should print them and bring them to class to take notes on. These lecture slides are not a substitute for what is covered in lecture – they are often graphics with no words to assist in illustrating points we will discuss in lecture. Also, worked-out examples of problems occur during lecture, and the problems are posed but solutions are not usually posted in the lecture slides. It is imperative that you attend lectures, participate in class, and take good notes, and keep up on the reading and homework.

Homework: To master the material, you must do the homework. One of the best ways to prepare for examinations is to try to solve problems like those assigned for homework or similar to problems solved in class, some of which come from the text book or from the ACS exam study guide. It is not enough to understand the concepts of chemistry; you must also be able to apply the concepts to solve chemical problems. There is no other way to learn chemistry than to practice it. Homework does not get turned in and does not get graded. However, exams and quizzes will test your mastery of the material, and the only way to master it is to do the homework.

In addition to in-class exams, there are two other parts of your grade that you must attend class to earn: collaborative group problems and in-class clicker-based quizzes.

Group problems: Approximately once a week in class, we will engage in collaborative problem solving, which will count toward your grade. There are no make-up group problems, but your lowest group problem score will be dropped. The solutions to the group problems will only be presented in class (they will not be given in the lecture slides or posted on the course website), and problems like the group problems will appear on exams.

In-class clicker-based quizzes: Approximately once a week in class, you will be presented with a brief quiz in class. The quiz will test your understanding of one or two of the homework questions, either from the text book or from the ACS guide. There are no make-up quizzes, but your three lowest quiz grades will be dropped. The quizzes will be done on paper until the add-drop deadline. After the deadline, clickers will be loaned to students and quizzes will be clicker-based. You must bring your clicker with you to each class. If you do not bring your clicker to class then you cannot get credit for a quiz that occurs during that class. Clickers must be returned at the end of the semester or else an "Incomplete" grade will result.

Exams: There will be three in-class exams, the best two of which will count toward your grade in the course. Examinations ask you to demonstrate your mastery of the material through both qualitative (concept-based) and quantitative (calculation- or model-based) problems. In addition to mastering the lecture material, you will occasionally be required to learn material from the book which is not presented in lecture. I will be clear about what material from the book you will be responsible for. Use the book to complement the lectures.

Pre-test and post-test: In order to provide you with some individualized feedback and help you prepare for the final exam, everyone will take a pre- and post-test. These tests will be administered during lab periods so that they will not take up lecture time -- all students in Chem 116 are required to take these tests, even if you are not enrolled in Chem 118. If you are not enrolled in Chem 118, you must arrange to take the test at one of the lab times, or make arrangements with Dr. Sevian to take the test at another time during the week that the test is being given. The pre-test will be given during Lab #1 or Lab #2 (watch the announcements in lecture and on the course website to find out when). It is a 50-minute test of the material for the course. The pre-test establishes a baseline so that you can measure your progress in

the course. The post-test will be given at Lab #9 or Lab #10 (watch for announcements in lecture and on the website). On the last day of the course, students will be given an Individualized Academic Prescription based on pre-test and post-test scores. This individualized feedback will give you some suggestions on which material you should consider concentrating on studying for the final exam. You will earn attendance grades of 10 points each for the pre- and post-tests. If you miss one of these tests and do not make it up during the week that the test is being given, you will forfeit the 10 points associated with the test.

Discussion

Discussion sections are intended to give you opportunities to deepen your understanding of the material, to explain homework problems, and to prepare you for the exams. Homework is not collected or graded, and worked-out answers are available in the Solutions Manual, which you have purchased with your text book. (There are also copies of the text book and solutions manual on reserve at Healey Library.) Although you will not turn in your homework, you should always attempt to do the assignments before attending discussion. Attendance in discussions will be taken. If you cannot attend your regularly scheduled discussion section, you may attend the other section the same week. You may miss three discussion sessions without penalty, but each subsequent absence will result in a 10-point deduction from the 50 point maximum for discussion. Discussions will begin the week of September 8. In keeping with the policy from Chem 115, if you are easily able to complete a homework assignment and do not have any questions, you will be allowed to receive credit for attending discussion if you arrive to your regularly scheduled discussion section five minutes prior to the beginning and show the discussion instructor your completed homework. The discussion instructor will check one or two problems on the homework, and if they are correct, you will be given the option of signing in and receiving credit for that discussion section but you do not have to attend it. For the sake of the students who attend the discussion, the instructor will begin discussion promptly at the scheduled start time, and will not permit this option after discussion begins.

Optional Facilitated Study Group (FSG)

Thanks to a grant from the National Science Foundation, the university will likely be offering facilitated study groups for students in Chem 116. If these are offered, study groups will meet once per week for one hour, and will be facilitated by a chemistry graduate student who is experienced at teaching chemistry and has been trained as a study group facilitator. Students who elect to participate in an FSG must commit to attending it every week. There is no credit associated with being in an FSG, but students in previous semesters do report that the FSG's helped them tremendously. The goals of the FSG are to provide students with the opportunity to work collaboratively to solve difficult chemistry problems, foster friendships based on common academic interests, and create an environment where students inspire each other to maintain a high level of commitment to excellence. FSG's will begin the week of Sept 15, after polling the class to determine the most optimal times to schedule the FSG's.

Laboratory

The laboratory schedule and instructions for the individual experiments are available from the website under the heading "Laboratory." The Laboratory is a separate course, Chem 118, that must be taken as a co-requisite unless you qualify for an exemption. Please contact your laboratory instructor to discuss any matters (e.g., absences) related to the Laboratory. If you contact me about lab matters instead of your instructor, there will be a delay in your instructor responding.

Calculator Policies

Calculators may be used in all aspects of this course, including exams. A simple scientific calculator sufficed for the first semester course, but in Chem 116 you may find it useful to have a calculator that can solve quadratic equations. **During an exam you may not use any calculator or device that is capable of communicating with any other calculator or device, therefore, graphing calculators that have built-in infrared communication and cell phones are not permitted at exams.** Also, you may not use Palm Pilots or similar devices in lieu of a calculator during exams. Anyone using such a device on an exam will receive a zero for the exam. Be sure you know how to operate your calculator before you have to use it in a test situation. Before arriving to an exam, be sure your calculator is working properly and that it has fresh batteries (if needed) or will work in low light (if solar powered). You may bring a backup calculator to exams, if you like. **Calculator sharing is not allowed during exams.**

Tests and Academic Honesty

Except in highly unusual circumstances, there are no make-up examinations. The dates for the exams are listed below and are also in the calendar. Exams will be given during the normal lecture time. There are three mid-term exams in the course, and one of them is dropped when calculating the course grade. If you are unable to attend one of the exams, this will most likely be the exam that is dropped. If you are tardy for an exam for a legitimate reason (e.g., car accident on the way to the university) you must call me or send an email in advance of the exam or as soon as possible under the circumstances. In cases of real emergency, you *might* be eligible to start the exam late. *Absence without notice and/or legitimate cause will result in a score of zero for the exam.* Make every effort to arrive on time to each exam. If you arrive late, you will not be given extra time, except in special circumstances. No one arriving late to an exam will be allowed to take the exam after the first paper has been handed in, unless special arrangements have been made in advance. Although your lowest exam score will be dropped in determining your course grade, you are strongly encouraged to take every exam.

During exams you are allowed to have pencils, erasers, and your calculator (with extra batteries, if needed) -- nothing else. A periodic table will be supplied with each exam. You may *not* have notes or open books. You are not allowed to bring your own scrap paper to the exam; scrap paper will be provided at the exam. You are not allowed to store course information in your calculator to use as an electronic "cheat sheet." Where indicated, you must show work that leads to the answers you give. This means that the correct answer with no work, or work that does not logically lead to it, receives zero credit. Your work must be your own, with no assistance received from anyone else. You should also take reasonable precautions to ensure that no one copies from you. Academic dishonesty will not be tolerated and may result in your failing the exam, failing the course, or being expelled from the University, depending on the circumstances.

Grading Policies

Grades are based on the following sum of points:

	<u>Points possible</u>
Best two of three in-class exams (100 points each)	200
Comprehensive final exam	200
Collaborative problem-solving (in class)	50
In-class clicker quizzes	80
Pre- and post-tests	20
Discussion attendance	50
Total points possible:	600

The course is not graded on a curve. Percentages are calculated simply as points earned divided by points possible. Grades will be based on the following percentages (rounded to the nearest integer percentage point):

<u>Percentage range</u>	<u>Grade range</u>
90-100	A
80-89	B
70-79	C
60-69	D
0-59	F

No student receiving less than 60% of the possible points should expect a passing grade, with the following exception: any student who receives 60% or better on the final examination will receive a grade of at least D-. Grades of INC (incomplete) will only be awarded if (a) a student is passing the course, *and* (b) the reason the student cannot complete the course is beyond the student's control.

Accommodations

Section 504 and the Americans with Disabilities Act of 1990 offers guidelines for curriculum modifications and adaptations for students with documented disabilities. If applicable, students may obtain adaptation

recommendations from the Ross Center (617-287-7430). The student must present these recommendations to and discuss them with each professor within a reasonable period, preferably by the end of the Drop/Add period. [Students are required to adhere to the Code of Student Conduct, including requirements for academic honesty, delineated in the University of Massachusetts Boston Graduate Studies Bulletin, Undergraduate Catalog, and relevant program student handbook(s).]

This syllabus is subject to change. Instructions given in class supercede syllabus content.

Homework

We will cover chapters 10 through 21, excluding chapters 12 and 18, in the text. Please see the "Assignments" section of the course website for detailed reading and homework problem assignments. The Course Calendar is at the end of this syllabus. If changes are made to it (e.g., due to snow days), a revised calendar will be posted under the "Information" section on the website. Sample exams, reference tables, examples of problem solving strategies, and other useful information are also posted on the website.

Detailed reading and homework assignments are posted on the course website.
www.chem.umb.edu

Examination Schedule

Exam	Chapters Covered (approximation)	Date
Test 1	10-11	Tuesday, September 30
Test 2	13, 14, 21, 15	Thursday, October 30
Test 3	16, 17	Thursday, November 20
Final Exam	20, 19 and all the other chapters as well	As officially scheduled

Order of Topics Covered and Corresponding Sections in Text


I intend to cover the following topics associated with the chapters and sections listed below from the Brown, LeMay & Bursten, 10th ed. text. The lectures, not the book, constitute the principal source of material for the tests. Use the book to complement the lectures. See section on Lectures that begins on page 2 of this syllabus for more information on this.

Topic	Chapters & Sections in Brown et al.
Gases	Chapter 10 (all sections)
Intermolecular forces, liquids and solids	Chapter 11 (omit section 11.7)
Properties of solutions	Chapter 13 (omit section 13.6)
Chemical kinetics: rates & mechanisms	Chapter 14 (all sections)
Nuclear chemistry	Chapter 21 (sections 21.1, 2, 3 and 4)
Chemical equilibrium: general	Chapter 15 (all sections)
Acid-base equilibria	Chapter 16 (omit section 16.11) and Chapter 17 (sections 17.1, 2, 3 and 4)
Electrochemistry	Chapter 20 (omit sections 20.7 and 20.8)
Chemical thermodynamics	Chapter 19 (all sections)

Chem 116 – Section 1
Course Calendar
Fall, 2008

- Lecture meets every Tu/Th 2:00-3:15pm, in Lipke Auditorium (S/1/003A). Lecture topics and chapters from which they derive are listed on this schedule.
- Discussion sections meet either Tu 12:30-1:20 (section 1), led by Prof. Wei Zhang (wei2.zhang@umb.edu) or Th 12:30-1:20 (section 2), led by Prof. Timothy Dransfield (timothy.dransfield@umb.edu). Both discussion sections are in S/2/065. Discussion begins the week of September 8. There is an optional discussion session on Thursday, September 4, to review math needed for Chem 116. The Discussion # in the calendar below refers to the Homework Assignment # that is covered at that Discussion session.
- Labs (Chem 118) are a separate course. The lab schedule is listed on this Chem 116 course calendar for your convenience. Labs meet either M 1:00-5:00 (section 1) or W 1:00-5:00 (section 2), both in S/2/035. Both labs are led by Prof. Caren Seagraves. Her email address is centercls@gmail.com. Laboratory classes begin the week of September 8.

Monday	Tuesday	Wednesday	Thursday	Friday
9/1 Labor Day (holiday)	9/2 <i>First day of class</i> No discussion Gases (ch. 10)	9/3 No lab	9/4 Optional discussion section (mostly math review) Gases (ch. 10)	9/5
9/8 Lab 1 Limiting reagents	9/9 Discussion 1 Gases (ch. 10) <i>Add/drop ends</i>	9/10 Lab 1	9/11 Discussion 1 IM forces (ch. 11)	9/12
9/15 Lab 2 Boyle's law	9/16 Discussion 2 IM forces (ch. 11)	9/17 Lab 2	9/18 Discussion 2 IM forces (ch. 11)	9/19
9/22 Lab 3 Hexaminenickel(II) chloride synthesis	9/23 Discussion 3 Solutions (ch. 13)	9/24 Lab 3	9/25 Discussion 3 Review for Exam 1	9/26
9/29 Lab 4 Hexaminenickel(II) chloride analysis	9/30 Discussion 4 Exam 1 in class	10/1 Lab 4	10/2 Discussion 4 Solutions (ch. 13)	10/3
10/6 Lab 5 Qualitative analysis of anions	10/7 Discussion 5 Solutions (ch. 13)	10/8 Lab 5	10/9 Discussion 5 Kinetics (ch. 14)	10/10
10/13 No lab Columbus Day (holiday)	10/14 Discussion 6 Kinetics (ch. 14)	10/15 No lab	10/16 Discussion 6 Nuclear chemistry (ch. 21)	10/17

Monday	Tuesday	Wednesday	Thursday	Friday
10/20 Lab 6 Iodine clock rxn kinetics Mid-semester	10/21 Discussion 7 Equilibrium (ch. 15)	10/22 Lab 6	10/23 Discussion 7 Equilibrium (ch. 15)	10/24
10/27 Lab 7 Equilibrium constant determination	10/28 Discussion 8 Review for Exam 2	10/29 Lab 7	10/30 Discussion 8 Exam 2 in class	10/31
11/3 Lab 8 pH measurement & titration Spring 09 registration begins	11/4 Discussion 9 A-B equilibria (ch. 16)	11/5 Lab 8	11/6 Discussion 9 A-B equilibria (ch. 16) Pass/fail and course withdraw deadlines	11/7
11/10 No lab	11/11 Veteran's Day (holiday) No discussion or lecture	11/12 No lab	11/13 Discussion 10 More equilibria (ch. 17)	11/14
11/17 Lab 9 Buffer solutions	11/18 Discussion 10 Review for Exam 3	11/19 Lab 9	11/20 Discussion 11 Exam 3 in class	11/21
11/24 No lab	11/25 Discussion 11 Solubility & redox, Electrochem (ch. 20)	11/26 No lab	11/27 Thanksgiving recess	11/28 Thanksgiving recess
12/1 Lab 10 Electrochemistry	12/2 Discussion 12 Electrochem, non- standard conditions (ch. 20)	12/3 Lab 10	12/4 Discussion 12 Thermo (ch. 19)	12/5
12/8 Make-up lab may be offered	12/9 Discussion 13 Thermo (ch. 19)	12/10 Make-up lab may be offered	12/11 Discussion 13 Review chapters not covered in Exam 1, 2 and 3 reviews earlier	12/12 Last day of UMass classes
12/15	12/16	12/17	12/18	12/19
 FINAL EXAM PERIOD				